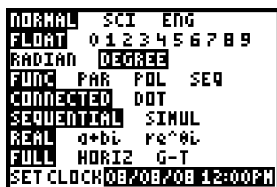


Note 1A • Setting the Mode

Press **[MODE]** to display a screen like that shown here. The settings highlighted are the ones that you will use most often in this course. If your calculator does not display these settings, follow the steps below to change them.



1. Use the arrow keys to highlight the setting you want to choose.
2. Press **[ENTER]** to register your selection.
3. When you have selected the settings you want, press **[2nd]** **[QUIT]** to exit from the mode screen.

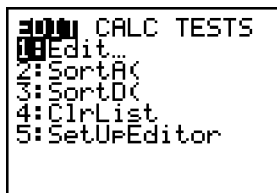
In this class you will need to change some of these settings during the year. The comments below may not mean much to you now, but your textbook will refer you back to this note several times during the course.

- a. **NORMAL** and **SCIENTific** refer to the way in which numbers are displayed. Both modes are used in the chapter on exponents. Usually this setting should be on **NORMAL** mode.
- b. **FLOAT** and **0 1 2...** refer to other ways in which numbers are displayed. **FLOAT** mode is useful in hiding long decimal answers and will make some numbers clearer. It is best to leave this setting on **FLOAT**, except in applications such as money, where only two decimal places make more sense. Remember to change this setting back to **FLOAT** when you are done.
- c. In this course you will use only the **DEGREE** mode. This setting is not important until you reach Chapter 11.
- d. **FUNCTION** and **PARAMetric** are two different types of graphing modes. Most of the work in this course will be in **FUNC** mode.
- e. **SEQUENTIAL** and **SIMULTaneous** tell the calculator to graph the equations one at a time, or to graph all the equations simultaneously.
- f. Usually you'll want your screen set to **FULL**. Occasionally, after you have been working with a program, you may find that you are left with a split screen. If this happens, be sure to change this setting back to **FULL**.

The remaining settings in the mode screen are not important in this course. If you find that your screen looks very strange when you try to do something, it's a good idea to look at the mode screen and check to see if any settings have been changed.

Note 1B • Entering Lists

There are six pre-set lists in the calculator: lists L₁ through L₆. You can create other named lists if needed. You can enter 999 elements into a list if enough memory is available.



Clearing Data

If a list already has data in it, move the cursor up so that the list name is highlighted and press **CLEAR** **ENTER**.

Entering Data Directly into a List

Follow the steps below to enter data (such as 400, 455, 390, 450, 360, 320, 480, 480) into a list.

- a. Press **STAT** **1** (Edit...).

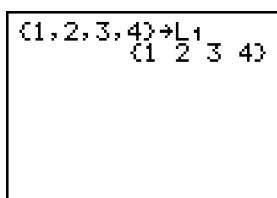
L1	L2	L3	1
400	-----	-----	
455			
390			
450			
360			

L1(6)=			

- b. Enter each number into list L₁. If you do not see list L₁, see the sections **Resetting a List** or **Recalling a List** that follow. After entering each data value, press **ENTER**. When you are finished entering the data, press **2nd** **[QUIT]**. If you wish to add a data value in the middle of the list, move the cursor to the place of insertion, press **2nd** **[INS]**, and then enter the number. To remove an entry from a list, highlight the entry and press **DEL**.

Entering Data into a List from the Home Screen

If you are working with a short list, you may want to enter it from the Home screen. To enter the data 1, 2, 3, 4 into list L₁ from the Home screen press **2nd** **[{]** **1** **[,]** **2** **[,]** **3** **[,]** **4** **2nd** **[{]** **STO→** **2nd** **[L1]** **ENTER**.



	L2	L3	1
1	-----	-----	
2			
3			
4			

L1 = {1, 2, 3, 4}			

(continued)

You can also enter a list into the Home screen without storing it in a stat list.

$\{1, 2, 3, 4\}$
$\{1 \ 2 \ 3 \ 4\}$

期	L2	L3	1
-----	-----	-----	

L1 =

Naming a List

If you name a list, then you can save it for later use. To name a list, highlight the name of any list, for example L₁, L₂, and so on, and press **[2nd]** **[INS]**. A new list will appear to the left of the list you highlighted. Enter a name for the list, for example, YEAR. (The flashing A tells you that you are in Alpha mode, so unless you want to enter a number as part of the name, you can just enter the list name.) Press **[ENTER]** and you will see that the list now has a name.

	L1	L2	1
	0	0	
	40	657	
	72	703	
	94	726	
	137	772	
	176	815	
	186	835	

Name=

	L1	L2	1
	0	0	
	40	657	
	72	703	
	94	726	
	137	772	
	176	815	
	186	825	

Name=YEAR

YEAR	L1	L2	1
-----	0	0	
	40	657	
	72	703	
	94	726	
	137	772	
	176	815	
	186	835	
YEAR =			

Resetting a List

To reset the calculator so that only lists L₁ through L₆ are displayed, press **STAT** and select 5:SetUpEditor. This action will not delete a named list from the calculator's memory and you will still be able to recall a named list with its stored data.

YEAR	L1	L3	1
YEAR(0)	---	---	

```

3000 CALC TESTS
1:Edit...
2:SortA(
3:SortD(
4:ClrList
5:SetUpEditor

```

SetUpEditor Done

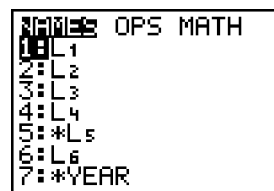
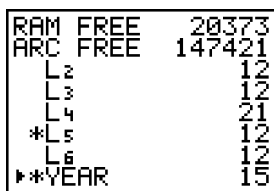
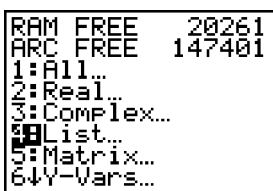
L1	L2	L3	1
██████	-----	-----	

L1() =

Deleting and Archiving a List on the TI-83 Plus or TI-84 Plus

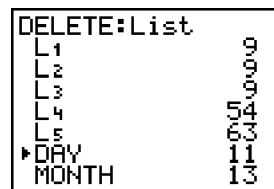
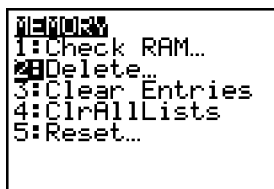
To delete a list, press **[2nd] [MEM]**, select 2:Mem Mgmt/Del..., and then 4:List..., arrow to the list you want to delete, and press **[DEL]**. You can delete a pre-set list or a named list. If you delete a list, you lose the data in the list. To avoid losing the data, instead of pressing **[DEL]**, you can press **[ENTER]** to mark the list with an asterisk. This is called archiving and will temporarily disable the list(s) you mark. An archived list will not appear on the screen when you press **[STAT] 1** (Edit...). By pressing **[2nd] [LIST]** you can see that each archived list is preceded by an asterisk. An archived list retains its data but cannot be used until it is enabled. To enable an archived list, press **[2nd] [MEM] 2** (Mem Mgmt/Del...) **[4]** (List...), arrow to the list you want to enable, and press **[ENTER]**. The asterisk disappears. Press **[2nd] [QUIT]** to return to the Home screen.

(continued)



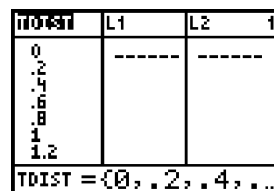
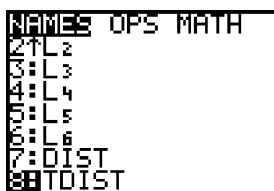
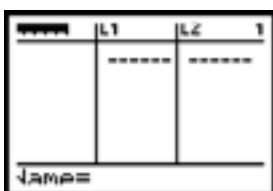
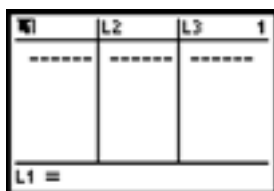
Deleting a List on the TI-83

To delete a list, press **2nd** [MEM], select 2:Delete..., and then 4:List..., arrow to the list you want to delete, and press **ENTER**. You can delete a pre-set list or a named list. If you delete a list, you lose the data in the list. Press **2nd** [QUIT] to return to the Home screen.



Recalling a List

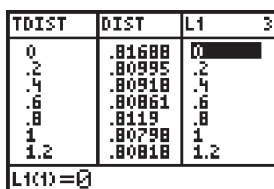
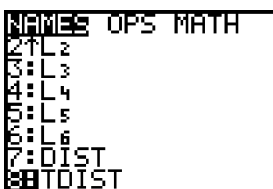
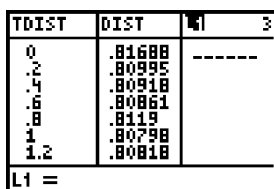
Press **STAT** **1** (Edit...) to display the current lists. Next, create a blank, nameless list by highlighting a list name and pressing **2nd** [INS]. You now have a blank, nameless list ready to be named. To recall one of the pre-set lists (lists L1 through L6) that you previously deleted, press **2nd** [L1] or **2nd** [L2] and so on, and **ENTER**. The name is back, but not the data. (You can recall all deleted pre-set list names by using the **Resetting a List** procedure.) To recall a previously named list that was hidden from view by **Resetting a List**, press **2nd** [LIST], arrow down to the list you want to recall, and press **ENTER** **ENTER**. The list name and data reappear.



On the TI-83 Plus or TI-84 Plus, to recall a list that is archived, you must enable the list first and then recall it. Using the **Resetting a List** procedure will enable lists L1 through L6 whether they are archived or not.

Moving a List

To move a list, begin by highlighting the name of an empty list. Press **2nd** [LIST], arrow down to the name of the list you want to move, and press **ENTER** **ENTER**. The list data appears. You can now delete or overwrite the data in the original list, and the data will remain in the new list.



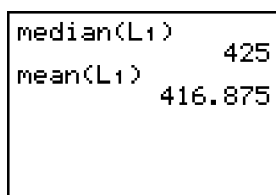
Note 1C • Median and Mean

Enter the data into a list, and return to the Home screen by pressing $\boxed{2\text{nd}} \boxed{\text{QUIT}}$.
 (See **Note 1B** if you don't remember how to enter data into a list. The screen here uses the same data as the first list entered in **Note 1B**.)

- a. Press $\boxed{2\text{nd}} \boxed{\text{LIST}}$ and arrow over to MATH.
- b. Choose 4:Median(or 3:Mean(.

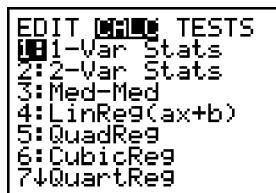


- c. Press $\boxed{2\text{nd}} \boxed{\text{L1}}$ (or whichever list contains the data) and close the parentheses.
- d. Press $\boxed{\text{ENTER}}$ to find the value.

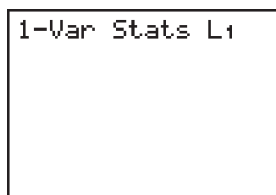


You can also calculate all the statistical values of a data set at once, including the median, mean, and the five summary values.

- a. Press $\boxed{\text{STAT}}$ and arrow over to CALC.
- b. Choose 1:1-Var Stats.



- c. Press $\boxed{2\text{nd}} \boxed{\text{L1}}$ (or whichever list contains the data).



- d. Press $\boxed{\text{ENTER}}$.

(continued)

Use the down arrow to display the entire list of values.

$\bar{x} = 416.875$	the mean
$\Sigma x = 3335$	the sum of the x -values
$\Sigma x^2 = 1414425$	the sum of the squares of the x -values
$Sx = 58.73290025$	the sample standard deviation
$\sigma x = 54.93959751$	the population standard deviation
$n = 8$	the number of data values
$\min X = 320$	the minimum data value
$Q1 = 375$	the first quartile
$\text{Med} = 425$	the median
$Q3 = 467.5$	the third quartile
$\max X = 480$	the maximum data value

```
1-Var Stats
x̄=416.875
Σx=3335
Σx²=1414425
Sx=58.73290025
σx=54.93959751
n=8
```

```
1-Var Stats
n=8
minX=320
Q1=375
Med=425
Q3=467.5
maxX=480
```

Errors

If you select 1-Var Stats and forget to enter the list name, the calculator default will be list L1. If you get ERR:INVALID DIM, you have selected a blank list.

Note 1D • Box Plots

Entering the Data

Enter the data set into a list. List L1 is used for this example. (See Note 1B if you need help entering data.)

L1	L2	L3	1
400	-----	-----	
455			
390			
450			
360			
320			
480			
L1 = (400, 455, 390...			

Setting the WINDOW Values

Press **WINDOW** and enter the following values into the WINDOW screen.

Xmin = a number slightly less than the minimum of the data.

Xmax = a number slightly greater than the maximum of the data.

Xscl = the distance between tick marks. Although this number is not critical to graphing a box plot, if it's too small, the tick marks will make the x -axis appear too thick.

Ymin = 0.

Ymax = 10. This number is not important for a box plot. Any number greater than Ymin will work.

Yscl = 0. This number does not affect a box plot.

Xres = 1. This number does not affect a box plot.

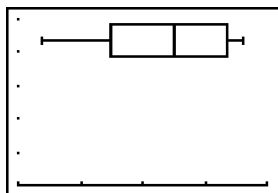
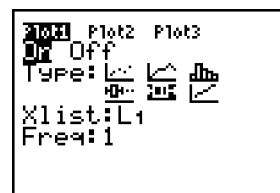
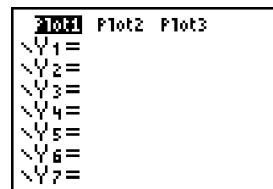
```
WINDOW
Xmin=300
Xmax=500
Xscl=50
Ymin=0
Ymax=10
Yscl=0
Xres=1
```

(continued)

Displaying the Box Plot

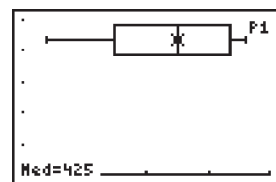
This example uses the data in list L1, but you can choose any list.

- Clear or turn off any equations in the Y= screen. (Press $\boxed{Y=}$. Place the cursor anywhere in an equation and press $\boxed{\text{CLEAR}}$ to delete the equation. Or, move the cursor over the highlighted equal sign of any equation you don't want to delete, and press $\boxed{\text{ENTER}}$ to turn off the equation.)
- Press $\boxed{2\text{nd}}$ [STAT PLOT] $\boxed{1}$ (Plot1...). (You can choose any of the three stat plots.)
- Select On, Box Plot, L1, 1. (To select list L1 press $\boxed{2\text{nd}}$ [L1].)
Note that there are two types of box plots available. The first type will not connect outliers to the rest of the plot. The second type will. If you choose the first type, you will also have to indicate the mark you want to use for any outlying points.
- Press $\boxed{\text{GRAPH}}$.



Tracing on a Box Plot

Press $\boxed{\text{TRACE}}$. The trace option allows you to see the five number summary values for the box plot by pressing the left and right arrows. If you press the up and down arrows, you move from one box plot to another. (See the **Graphing More Than One Box Plot** section that follows.) Look in the upper-left corner of the calculator screen to see which plot the calculator is tracing. The trace option always starts with the stat plots and then moves to equations on the Y= screen (if any are turned on), even if you can't see them in the current window. Be sure to turn off any plots and any equations you do not want to see or trace.



Graphing More Than One Box Plot

The calculator can graph up to three box plots at the same time. Follow the directions for making a box plot and set up Plot2, Plot3, or both. Be sure the list in which you've entered the data matches the list you select when setting up each box plot.

Errors

If you don't see a graph, then check the Xmin and Xmax values to make sure that your data lies between them. If you get ERR:INVALID DIM when you try to

(continued)

graph, you have selected a blank list. If you get ERR:WINDOW RANGE, you have probably assigned an Xmax value that is less than the Xmin value or a Ymax value that is less than the Ymin value.

Clean-up

When you are finished graphing box plots, you might want to turn off all the plots so that they don't interfere with other graphing screens. Press **2nd** [STAT PLOT] **4** (PlotsOff) **ENTER**, or press **Y=**, arrow to any plot that is highlighted, and press **ENTER**.

Note 1E • Histograms

Entering the Data

Enter the data into a list. List L1 is used for this example. (See Note 1B if you need help entering the data.)

L1	L2	L3	1
400	-----	-----	
455			
390			
450			
360			
320			
480			
L1 = {400, 455, 390...			

Setting the WINDOW Values

Press **WINDOW** and enter the following values into the WINDOW screen.

Xmin = a number equal to or slightly less than the minimum of the data.

Xmax = a number greater than the maximum of the data.

Xscl = the width of each bar. Use an integer value that is approximately equal to $\frac{X_{\max} - X_{\min}}{8}$.

Ymin = -2. Using a negative value for Ymin allows you to trace on the graph without the trace values interfering with the graph itself.

Ymax = the height of the tallest bar. Make an intelligent guess. You may have to revise this value when you look at the graph. Tracing on the graph can help you determine the maximum bar height.

Yscl = the distance between tick marks on the y-axis. The number you choose will depend on the Ymax value. You don't want tick marks that are too close together, or the y-axis will appear too thick.

Xres = 1. This number does not affect a histogram.

WINDOW	
Xmin=	300
Xmax=	500
Xscl=	25
Ymin=	-2
Ymax=	5
Yscl=	1
Xres=	1

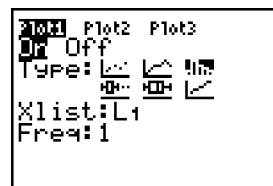
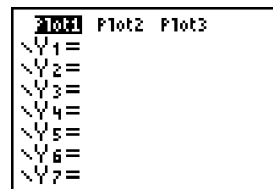
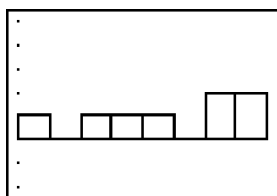
The Xscl value determines the width of the histogram bars. You may need to extend the range one bar-width beyond what you think it should be by increasing the Xmax value. You may want to create a histogram with as few as five or as many as ten bars. Experiment with different values for Xscl to see what effect each has on the graph.

(continued)

Displaying the Histogram

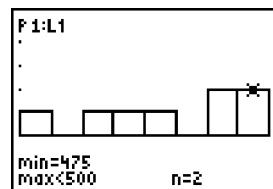
This example assumes the data is in list L₁, but you can choose any list.

- Clear or turn off any equations in the Y= screen. (Press $\boxed{Y=}$. Place the cursor anywhere in an equation and press $\boxed{\text{CLEAR}}$ to delete the equation. Or, move the cursor over the highlighted equal sign of any equation you don't want to delete, and press $\boxed{\text{ENTER}}$ to turn off the equation.)
- Press $\boxed{2\text{nd}} \boxed{[\text{STAT PLOT}]} \boxed{1}$ (Plot1...). (You can choose any of the three stat plots.)
- Select On, Histogram, L₁, 1. (To select list L₁ press $\boxed{2\text{nd}} \boxed{[L_1]}$.)
- Press $\boxed{\text{GRAPH}}$.



Tracing on a Histogram

Press $\boxed{\text{TRACE}}$. The trace option always starts with the stat plots and then moves to equations in the Y= screen (if any are turned on), even if you can't see them in the current window. Be sure to turn off any plots and any equations you do not want to see or trace.



Errors

You will get ERR:STAT if you try to create a histogram with more than 47 intervals (bars). Make the Xscl value larger to correct this error. You may also get an error message if you haven't turned off a plot you're not interested in seeing or you have changed the data or the window settings.

Clean-up

When you are finished graphing histograms, you might want to turn off all the plots so that they don't interfere with other graphing screens. Press $\boxed{2\text{nd}} \boxed{[\text{STAT PLOT}]} \boxed{4}$ (PlotsOff) $\boxed{\text{ENTER}}$, or press $\boxed{Y=}$, arrow to any plot that is highlighted, and press $\boxed{\text{ENTER}}$.

Note 1F • Scatter Plots

Entering the Data

Enter the x-coordinates (horizontal axis) into one list and the y-coordinates (vertical axis) into another list. List L₁ and list L₂ are used for this example. (See Note 1B if you need help entering the data.)

L1	L2	L3	3
27	0		
10	2		
18	2		
47	2		
36	2		
8	15		
L3(1)=			

(continued)

Setting the WINDOW Values

Press **WINDOW** and enter the following values into the WINDOW screen.

Xmin = a number less than the minimum value in the list of x -coordinates.

Xmax = a number greater than the maximum value in the list of x -coordinates.

Xscl = the distance between tick marks. You can use 0 (no tick marks) or a value usually less than or equal to $\frac{X_{\max} - X_{\min}}{10}$. If your Xscl value is too small, the x -axis will appear too thick.

Ymin = a number less than the minimum value in the list of y -coordinates.

Ymax = a number greater than the maximum value in the list of y -coordinates.

Yscl = the distance between tick marks. You can use 0 (no tick marks) or a value usually less than or equal to $\frac{Y_{\max} - Y_{\min}}{10}$. If your Yscl value is too small, the y -axis will appear too thick.

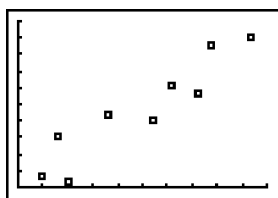
Xres = 1. This number does not affect a scatter plot.

```

WINDOW
Xmin=0
Xmax=50
Xscl=5
Ymin=0
Ymax=50
Yscl=5
Xres=1
    
```

Displaying the Scatter Plot

- Clear or turn off any equations in the $Y=$ screen. (Press **Y=**. Place the cursor anywhere in an equation and press **CLEAR** to delete the equation. Or, move the cursor over the highlighted equal sign of any equation you don't want to delete, and press **ENTER** to turn off the equation.)
- Press **2nd** [STAT PLOT] **1** (Plot1...). (You can choose any of the three stat plots.)
- Select On, ScatterPlot, L1 for Xlist (if your x -coordinates are in list L1); L2 for Ylist (if your y -coordinates are in list L2), and choose a mark type to indicate the data points.
- Press **GRAPH**.



```

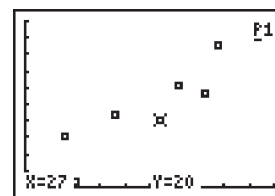
2nd F1 Plot1 Plot2 Plot3
Y1=
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
    
```

```

2nd F2 ZOOM
1:Plot1...Off
  L1 L2
2:Plot2...Off
  L1 L2
3:Plot3...Off
  L1 L2
4:PlotsOff
    
```

Tracing on a Scatter Plot

Press **TRACE**. The trace option always starts with the stat plots and then moves to equations in the $Y=$ screen (if any are turned on), even if you can't see them in the current window. Be sure to turn off any plots and any equations you do not want to see or trace.



(continued)

Graphing More Than One Scatter Plot at a Time

The calculator can graph up to three scatter plots at the same time. Follow the directions for displaying a scatter plot and set up Plot2, Plot3, or both. Be sure the lists in which you've entered the data match the lists you select when setting up each scatter plot. Be sure to choose a different mark for each plot.

Errors

An ERR:DIM MISMATCH message means that the two lists do not have the same number of entries. This could also happen if you left a stat plot on that you're not using, or if you named the wrong list when you set up the scatter plot.

If the graph does not look like you think it should, try any (or all) of the following: Clear or turn off all equations in the $Y=$ screen. Press $\boxed{2\text{nd}} \boxed{[FORMAT]}$ and select GridOff. Press \boxed{MODE} and check that the calculator is set to Func.

Clean-up

When you are finished graphing scatter plots, you might want to turn off all the plots so that they don't interfere with other graphing screens.

Press $\boxed{2\text{nd}} \boxed{[STAT PLOT]} \boxed{4}$ (PlotsOff) \boxed{ENTER} or press $\boxed{Y=}$, arrow to any plot that is highlighted, and press \boxed{ENTER} .

Note 1G • POINTS Program

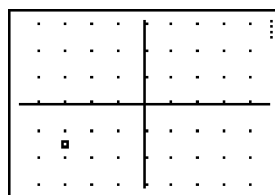
First, link or manually enter the program into your calculator. (See **Note 0F** or **Note 0G**.) The POINTS program plots a single point in a graphing window that measures from -4.7 to 4.7 on the horizontal axis and from -3.1 to 3.1 on the vertical axis. You identify and enter the coordinates of the point rounded to the nearest 0.5 units.

- To execute the program, press \boxed{PRGM} , arrow to POINTS, press \boxed{ENTER} twice, and then press $\boxed{1}$ or \boxed{ENTER} to select 1:PLAY.
- Study the screen and determine the coordinates of the marked point.
- Press \boxed{ENTER} .

- Enter the x -coordinate, a comma, the y -coordinate, and close the parentheses. Then press \boxed{ENTER} .

```

PRGM EDIT NEW
4:GEOMPROB
5:INOUT
6:INOUTEXP
7:LINE1
8:LINE2
9:PARAB
10:POINTS
    
```

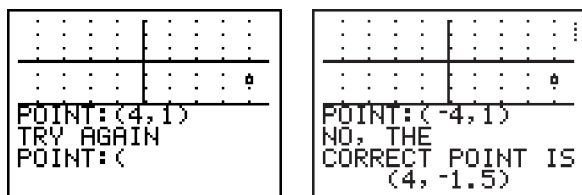


```

POINT: (-3, -1.5)
RIGHT!
    
```

(continued)

- POINT: (4, 1)
TRY AGAIN
POINT: (



- ## Errors

Clean-up

If you quit POINTS without using the QUIT option in the program, you might be left with a split screen. Press **[MODE]** and select Full. Press **[2nd]** **[FORMAT]** and select GridOff. Press **[2nd]** **[STAT PLOT]** **[4]** (PlotsOff) **[ENTER]**, or press **[Y=]**, arrow to any plot that is turned on, and press **[ENTER]**.

```

PROGRAM:POINTS
3→W:Lb1 1
Full:PlotsOff
FnOff :GridOn
randInt(-9,9,1)/2→L1
randInt(-6,6,1)/2→L2
Plot1(Scatter,L1,L2,□)
ZDecimal:Pause
Lb1 2:Horiz
Output(4,1," USE 0 TO QUIT")
Repeat W≠1
Input "POINT:(",Str1
inString(Str1,",")→C
If C=0:Goto 9
inString(Str1,")" )→P
If P=0:length(Str1)+1→P
sub(Str1,1,C-1)→Str2
sub(Str1,C+1,P-C-1)→Str3
String►Equ(Str2,Y2)
String►Equ(Str3,Y3)
FnOff
L1(1)→H:L1(1)→Y

```

```

If Y2=H and Y3=Y:Then
Disp "          RIGHT!"
0⇨W:Pause
Else:If W=1
Then
Disp "NO, THE"
Disp "CORRECT POINT IS"
Output(4,1,"      ")
Output(4,6,H)
7+(H<0)+2(fPart(H)≠0)⇨H
Output(4,H," ")
Output(4,H+1,Y)
H+2+(Y<0)+2(fPart(Y)≠0)⇨K
Output(4,K," ")
2⇨W:Pause
Else:1⇨W
Disp "TRY AGAIN"
End:End:End
Goto 1

Lbl 9:Full:GridOff:PlotsOff
Disp "PRESS ENTER","TO REPLAY.",",",
"PRESS 1", "AND ENTER","TO QUIT."

```

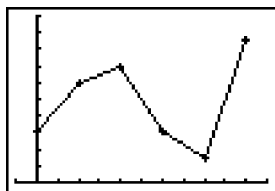
Note 1H • Connecting the Points

The *xyLine* connects a sequence of points with line segments. The order in which the points are connected is the order in which the coordinates appear in the lists.

Enter data and set the window as described in **Note 1F**.

Displaying the Connected Points

- Clear or turn off any equations in the $Y=$ screen. (Press $\boxed{Y=}$. Place the cursor anywhere in an equation and press $\boxed{\text{CLEAR}}$ to delete the equation. Or, move the cursor over the highlighted equal sign of any equation that you don't want to delete, and press $\boxed{\text{ENTER}}$ to turn off the equation.)
- Press $\boxed{2\text{nd}} \boxed{[\text{STAT PLOT}]} \boxed{1}$ (Plot1...). (You can choose any of the three stat plots.)
- Select On, *xyLine*, L1 for Xlist (if your x -coordinates are in list L1), L2 for Ylist (if your y -coordinates are in list L2), and choose a mark type to indicate the data points.
- Press $\boxed{\text{GRAPH}}$.



If the points are not listed in ascending order by their x -coordinates, your *xyLine* will be scrambled with the line segments criss-crossing each other. To reorder your points correctly, go to the Home screen and press $\boxed{\text{STAT}}$ and select 2:Sort A(. Complete the command Sort (L1, L2) and press $\boxed{\text{ENTER}}$. Notice that the sort command puts list L1 in ascending order but maintains the original pairings between list L1 and list L2. (See **Note 10B**.)

Tracing Connected Points

Press $\boxed{\text{TRACE}}$. The trace option always starts with the stat plots and then moves to equations in the $Y=$ screen (if any are turned on), even if you can't see them in the current window. Be sure to turn off any plots and any equations you do not want to see or trace.

```

Plot1 Plot2 Plot3
Y1=
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=

```

```

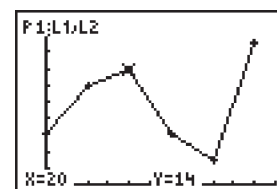
STAT PLOTS
1:Plot1...Off
   L1 L2
2:Plot2...Off
   L1 L2
3:Plot3...Off
   L1 L2
4:PlotsOff

```

```

Plot1 Plot2 Plot3
On Off
Type: L1 L2
Xlist:L1
Ylist:L2
Mark: *

```



(continued)

Errors

An ERR:DIM MISMATCH message means that the two lists do not have the same number of entries. This could also happen if you left a plot on that you're not using, or if you named the wrong list when you set up the xyLine.

If the graph does not look like you think it should, try one (or all) of the following: Clear or turn off all equations on the Y= screen. Press **2nd** **[FORMAT]** and select GridOff. Press **MODE** and make sure the calculator is set to Func and to Full.

Clean-up

When you are finished with the xyLine, you might want to turn off all the plots so that they don't interfere with other graphing screens. Press **2nd** **[STAT PLOT]** **4** (PlotsOff) **[ENTER]** or press **Y=**, arrow to any plot that is highlighted, and press **[ENTER]**.

Note 1I/App • Reading a Distance Using the EasyData App

You must have a TI-83 Plus or TI-84 Plus to use this Note. If you have a TI-83 and a CBR, see **Note 1I** below.

You will need a CBR (Calculator-Based Ranger).

Connect the CBR to the calculator. Press **APPS** and select EasyData. The CBR will immediately begin collecting distance data, which is displayed on your calculator screen. Press Quit (**GRAPH**) then OK (**GRAPH** again) to stop collecting data.

Note 1I • Reading a Distance Using the DIST Program

Follow the instructions in this note if you have a CBR (Calculator-Based Ranger) and a TI-83. If you are using a TI-83 Plus or TI-84 Plus with CBR or CBL, use the EasyData App described in **Note 1I/App** above.

You will need the DIST program. To link this program from another calculator, see **Note 0F**. If you must manually enter the program, see **Note 0G**.

- a. Connect your CBR to a graphing calculator using the calculator-to-CBR cable. Push in the cable firmly at both ends.
- b. Execute the program by pressing **PRGM**, then arrow down to DIST, and press **[ENTER]** twice.
- c. While the program is running, the calculator will continue to read distances from the CBR.
- d. Press **ON** and select 1:Quit to stop the program.

(continued)

```

PROGRAM: DIST
Full
ClrHome
Disp "NOW CHECKING THE"
Disp "CALCULATOR-CBR"
Disp "LINK CONNECTION."
Disp "PLEASE WAIT...."
{1,0}→L₁
Send {L₁}
{0}→L₂
Lbl M
{7}→L₁
Send(L₁)
Get(L₂)
If dim(L₂)=1 and L₂(1)=0
Then
ClrHome
Disp "***LINK ERROR***"
Disp "PUSH IN THE LINK"
Disp "CORD CONNECTORS"
Disp "FIRMLY THEN HIT"
Disp "[ENTER]."
Pause
Goto M
End
Disp " "
Output(6,1," STATUS: O.K.")
Output(8,10,"[ENTER]")
Pause
Full
ClrHome

Disp "PRESS [ENTER] TO"
Disp "BEGIN"
Disp " "
Disp " "
Disp "PRESS [ON] TO"
Disp "QUIT"
Pause
Lbl 1
{3,2,2,0}→L₁
Send(L₁)
Get(L₁)
Disp round (L₁(2),2)
Goto 1

```

Errors

If you are not getting a reading, make sure the link cable is connected tightly at both ends. If the cable is secure, try changing the batteries in the CBR.

Note 1J • Equations

To graph an equation on your calculator, the equation must be in the form $y =$ "some expression." If the equation contains variables other than x and y , you need to rewrite it using only x and y as variables.

- Press $\boxed{Y=}$.
- Enter the equation using the variable x . Press $\boxed{X,T,\theta,n}$ to enter the variable x .
- Setting a window for graphing equations is not as easy as setting a window for data. If it is an application problem, think about what values make sense for both x and y . You may need to try different windows to find one that is appropriate.
- Press $\boxed{\text{GRAPH}}$.

Tracing Equations and Plots on the Same Graph

Enter the data and set up a scatter plot. Enter the equation. Set the window. You can do these three steps in any order. When you press $\boxed{\text{GRAPH}}$, you will see the stat plot graphed first and the equation(s) graphed second. When you press $\boxed{\text{TRACE}}$, you will first trace the data in the stat plot. Press the down arrow to trace

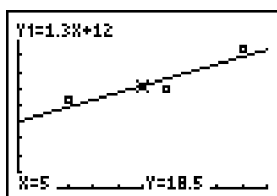
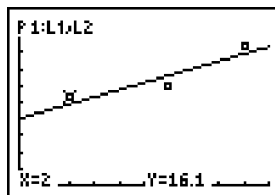
(continued)

other stat plots if they are turned on. By arrowing down again you will trace any equations that are turned on. Note the label in the upper left corner of the screen. The label P1 indicates that you are tracing Plot1. The labels L1 and L2 indicate that the data comes from list L1 and list L2. When you are tracing on an equation, the equation is displayed.

L1	L2	L3	3
2	16.1		
6	18.1		
9	25.3		

L3(1)=			

Plot1	Plot2	Plot3
Y1=1.3X+12		
Y2=		
Y3=		
Y4=		
Y5=		
Y6=		
Y7=		



PolarGC	
CoordOn	CoordOff
GridOff	GridOn
AxesOn	AxesOff
LabelOff	LabelOn
ExprOn	ExprOff

If you don't see P1:L1,L2 or the equation, press **2nd** [FORMAT] and select ExprOn. If ExprOn is not turned on, you will see a P1, P2, 1, 2, and so on, in the upper-right corner of the screen, but you will not see which lists are being plotted or the actual equation.

Errors

If you get an ERR: DIM MISMATCH message, turn off all the stat plots. Press **2nd** [STAT PLOT] **4** (PlotsOff) **ENTER** or press **Y=**, arrow to any plot that is highlighted, and press **ENTER**. If you see ERR: SYNTAX, check your equation and count the number of left and right parentheses to make sure they match. Look for numbers with two decimal points. Check that you used the negative or subtraction sign correctly. If you see the graph screen but nothing appears, you might have a problem with your equation or your window. Try changing one or both of these.

Note 1K • Formula-Generated Lists

Enter data into a list as in Note 1B. Move the cursor to the next list, arrow up to highlight the list name, and press **ENTER**. Enter the formula for the operations you wish to perform, such as **2nd** [L1] **+** **4** **7**. Then press **ENTER**. If you get an error message, select 2:Goto and press **CLEAR**. Make sure you are on the name of the list before you enter the list operation. You can do operations with list variables the same way you do with numbers. You can add, subtract, multiply, divide, or do any other mathematical operation.

L1	L2	L3	2
15			
5			
23			
17			
-12			
-25			

L2=L1+47			

L1	L2	L3	2
15	62		
5	52		
23	70		
17	64		
-12	35		
-25	22		

L2(1)=62			

(continued)

For another example, let list L_1 be a list of rectangle lengths and let list L_2 be the corresponding widths. Move the cursor so that it highlights list L_3 and enter the formula for the area of a rectangle, $L_1 * L_2$. Press **ENTER**.

L1	L2	#	L3
4	20		-----
9	6		
12.1	5.2		
13	10.1		
18.9	15		
22.6	2.9		
36.1	30		
L3 = L1 * L2			

L1	L2	L3	#
4	20	80	
9	6	54	
12.1	5.2	62.92	
13	10.1	131.3	
18.9	15	283.5	
22.6	2.9	65.54	
36.1	30	1083	
L3(1)=80			

List Formulas

If you enclose a formula in quotation marks (press **ALPHA** **["]**), the entries of the new list will automatically update if you change the values in the list referred to in the formula. For example, let list L_1 be 2, 3, 4, and define the name of list L_2 to be $5 * L_1$. Notice the mark to the right of list L_2 that indicates a formula name. Now edit one of the entries in list L_1 , for example, change the 3 to 5. Notice that the second entry in list L_2 automatically updates to 25.

L1	#	L2	#	L3	#
2		-----		-----	
3					
4					

L2 = "5*L1"					

L1	L2	#	L3	#
2	10		-----	
3	15			
4	20			

L2(1)=10				

L1	L2	#	L3	#
2	10		-----	
5	15			
4	20			

L1(2)=5				

L1	L2	#	L3	#
2	10		-----	
5	25			
4	20			

L1(3)=4				

To delete a formula move up to the list name and press **ENTER**. Then press **CLEAR** once to remove the formula but keep the list values. Press **ENTER**. Repeat this process a second time to remove the list values.

Errors

You will get an error if you clear a list that is used in defining a formula-generated list. Select 2:Goto and press **CLEAR**.

Note 1L • Matrices

The matrix menu allows you to work with up to ten matrices, $[A]$, $[B]$, ..., $[J]$. The dimensions of a matrix are the number of rows by the number of columns, that is, $r \times c$. The dimensions are limited to 99 rows and 99 columns or, more likely, by the memory available in your calculator.

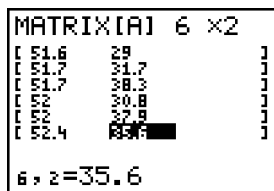
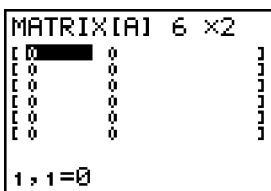
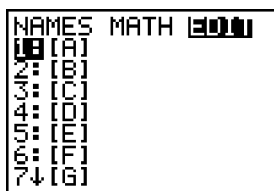
Entering a Matrix

The matrix EDIT menu allows you to construct and store a matrix. Press **2nd** **[MATRIX]** and arrow to EDIT. (On the TI-83, press **MATRIX** and arrow to EDIT.) Press **1** to edit the dimensions of $[A]$ and to enter the matrix values. Notice that as you press **ENTER** for each dimension, the matrix on the screen adjusts its size. Continue to enter each value into the matrix. Press **ENTER** after each entry and the cursor moves across the row and then down to the next row. The current position of the cursor and the cell value is shown by $r, c = \text{value}$ in the bottom-left corner of the screen. You can edit any entry by arrowing to the position and reentering the value. After you have entered all of the values, press **2nd** **[QUIT]** to store the matrix.

MATRIX	MATH	EDIT
1: [A]		
2: [B]		
3: [C]		
4: [D]		
5: [E]		
6: [F]		
7: [G]		

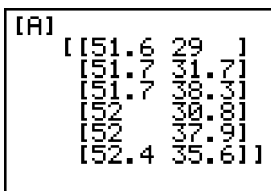
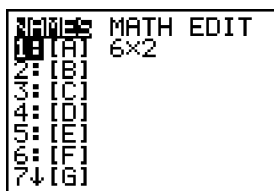
(continued)

Enter [A] to have dimensions 6×2 .

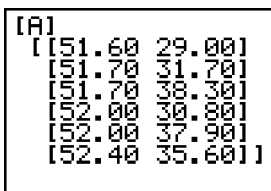
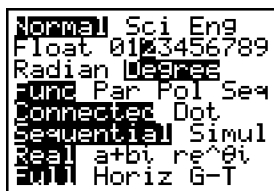


Displaying a Matrix

Press **2nd** [MATRIX] to see which matrices are stored in the calculator. (On the TI-83, press [MATRIX] to see which matrices are stored in the calculator.) You can see the dimensions of each stored matrix. To display the name [A] on the Home screen, press **2nd** [MATRIX] 1. (On the TI-83, to display the name [A] on the Home screen, press [MATRIX] 1.) Press **ENTER** to display the actual matrix.

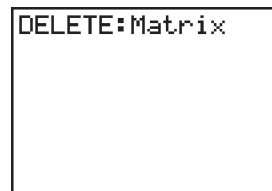
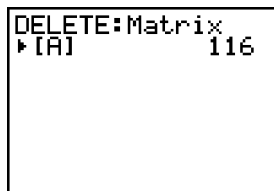
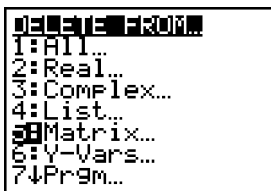
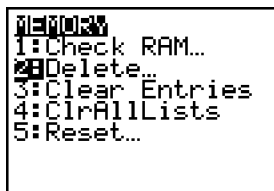


If you want a matrix to represent money, you can set the calculator so that all numbers show two decimal places. Press **MODE** and change the setting on the second line from Float to 2. All calculator numbers will now display two decimal places.



Deleting a Matrix from the Calculator

You can always change a matrix by arrowing to EDIT in the matrix menu and selecting the matrix you want to change. You might, however, want to conserve memory space and delete a matrix completely from your calculator. To delete a matrix, press **2nd** [MEM] 2 (Delete...) 5 (Matrix...), arrow to the matrix you want to delete, and press **ENTER**.



(continued)

Errors

If you get an ERR:MEMORY message, you've tried to enter matrix dimensions that exceed the available memory in the calculator.

An ERR:UNDEFINED message probably indicates that you have named a matrix that is not defined.

Note 1M • Multiplying a Matrix by a Number

To multiply a matrix by a number, multiply each cell value of the matrix by the number. For example, if [A] is the matrix from **Note 1L**, to multiply [A] by 50, enter $50 * [A]$ or $50[A]$ on the Home screen and press **ENTER**. The matrix answer appears on the screen.

```
[A]
[[51.6 29.1
[51.7 31.7]
[51.7 38.3]
[52. 30.8]
[52. 37.9]
[52.4 35.6]]]
```

```
50[A]
```

```
50[A]
[[2580 1450]
[2585 1585]
[2585 1915]
[2600 1540]
[2600 1895]
[2620 1780]]]
```

Multiplying a number by a matrix, $[A] * 50$ for example, is done in the same way.

```
[A]
[[51.6 29.1
[51.7 31.7]
[51.7 38.3]
[52. 30.8]
[52. 37.9]
[52.4 35.6]]]
```

```
[A]*50
```

```
[A]*50
[[2580 1450]
[2585 1585]
[2585 1915]
[2600 1540]
[2600 1895]
[2620 1780]]]
```

Errors

An ERR:UNDEFINED message probably indicates that you have named a matrix that is not defined.

Note 1N • Adding/Subtracting Matrices

To add or subtract two matrices, the matrices must have the same dimensions. Define [B] to have dimensions 3×2 , and enter the values below. (See **Note 1L**.)

- 1, 1 = 8.9 1, 2 = 9.1
2, 1 = 2.35 2, 2 = 2.65
3, 1 = 1.5 3, 2 = 1.6

```
MATRIX[B] 3 x2
[[ 8.9 9.1
[ 2.35 2.65
[ 1.5 1.6
3, 2=1.6
```

Define [C] to have dimensions 3×2 , and enter the values below.

- 1, 1 = 2.5 1, 2 = 2.25
2, 1 = 1 2, 2 = 1.25
3, 1 = .65 3, 2 = .5

```
MATRIX[C] 3 x2
[[ 2.5 2.25
[ 1 1.25
[ .65 .5
3, 2=.5
```

(continued)

On a clear Home screen, enter $[B] + [C]$ and press $\boxed{\text{ENTER}}$. The matrix showing on the screen is the sum of $[B]$ and $[C]$.

$[B] + [C]$

$[B] + [C]$
 $\begin{bmatrix} 11.4 & 11.35 \\ 3.35 & 3.9 \\ 2.15 & 2.1 & 1 \end{bmatrix}$

Errors

If you get **ERR:DIM MISMATCH**, you've tried to add (or subtract) two matrices that don't have the same dimensions.

An **ERR:UNDEFINED** message probably indicates that you have named a matrix that is not defined.

Note 1P • Multiplying Two Matrices

To multiply two matrices, the number of columns in the first matrix must match the number of rows in the second matrix. For example, if the first matrix has dimensions 1×3 and the second matrix has dimensions 3×2 , the three columns of the first matrix match the three rows of the second. The multiplication will be defined.

Enter $[D]$ and $[C]$ as shown in the screens here. (See **Note 1L**.)

MATRIX[D] 1 \times 3
 $\begin{bmatrix} 5 & 3 & 7 \end{bmatrix}$
 1, 3 = 7

MATRIX[C] 3 \times 2
 $\begin{bmatrix} 2.5 & 2.25 & 1 \\ 1 & 1.55 & 1 \\ .65 & .5 & 1 \end{bmatrix}$
 3, 2 = .5

Display $[D] [C]$ (or $[D] * [C]$) on the Home screen and press $\boxed{\text{ENTER}}$. The product appears on the screen. The dimensions of the product are (*the number of rows of the first matrix*) \times (*the number of columns of the second matrix*). In this example, a 1×3 matrix times a 3×2 matrix has a 1×2 answer.

MATH EDIT
 1: [A] 6 \times 2
 2: [B] 3 \times 2
 3: [C] 3 \times 2
 4: [D] 1 \times 3
 5: [E]
 6: [F]
 7: [G]

$[D] [C]$

$[D] [C]$
 $\begin{bmatrix} 20.05 & 18.5 \end{bmatrix}$

Errors

If you get **ERR:DIM MISMATCH**, then the number of columns in the first matrix does not match the number of rows in the second.

An **ERR:UNDEFINED** message probably indicates that you have named a matrix that is not defined.